

the gills are easily shed. The *Triptera columella*, when first taken, swims vigorously about, and protrudes a proboscis which curves downwards, which it frequently rapidly retracts into the interior of the body and as rapidly exserts again. The greater majority of small oceanic Crustaceans, like a large number of other animals which inhabit the high seas, are of a deep blue colour, which, however, changes to a bright red when the animals are placed in spirit.

I remain, Gentlemen,
Your obedient Servant,
ARTHUR ADAMS.

XXXVI.—*Notes on the Permian System of the Counties of Durham and Northumberland.* By RICHARD HOWSE, South Shields.

[Concluded from p. 312.]

GASTEROPODA.

33. CHITON LOFTUSIANUS, King.—The general form of this Chiton, and the size it attained, are at present unknown, for the plates have never been found articulated together. It may, perhaps, be inferred, from the size of the plates that have occurred, that it was rather a small species than otherwise.

The marginal outline of the first and last plates is semicircular, that of the second unguiform. The third plate, supposed by the author of the 'Perm. Mon.' to be the second, is somewhat triangular; the fourth is slightly furcated; and the other three, assuming it had eight altogether, are oblong or strap-shaped in marginal outline. The second, third and fourth plates are broad and very oblique; the fifth, sixth and seventh, narrow and transverse. The posterior plate, which is not 'capuliform,' but half-limpet-shaped, has its apex or mucro produced to a fine point. Seen in profile, all the plates, excepting the first or head-plate, are curved towards the posterior margin, considerably elevated along the dorsal line, and pressed down steeply on each side towards the lateral margin. The lateral areas of the intermediate valves, excepting the second, are large and distinctly defined. Occasionally a small sulcation or furrow may be seen on each side of the dorsal ridge, but this seems to be rather an accidental than a specific character. The entire surface of all the plates is minutely granulated or shagreened, and the striæ of growth are very distinct on the dorsal as well as on the lateral areas. The interior of the valves is minutely pitted or granulated. The apophyses or processes of attach-

ment of the mantle are large, nearly semicircular, and, as they are confined to the lower half of the dorsal area on each side, they are consequently very widely separated. It, perhaps, may be inferred, from the disparity in the shape and size of the plates, that this Chiton was much narrower in front than behind.

This Chiton is neither exactly described nor correctly figured in the 'Perm. Monograph,' for if the "*diagnosis*" given by Mr. King be correct, several species might be made from the valves that are found at Tunstall.

Peculiar to the shell-limestone of the North of England, in which, though not plentiful, it is very generally distributed.

34. CALYPTRÆA ANTIQUA, Howse. Pl. IV. figs. 16, 17.—In 1847 I found a single imperfect specimen of a patelliform shell at Tunstall Hill, which was described thus in the Tyneside Catalogue:—

"Shell small, patelliform, strongly ribbed longitudinally; margin crenulated; two deep furrows internally from the apex to the margin, corresponding with two strong ribs on the outer surface."

The only specimen found was not quite perfect round the margin, and the whole shell had the appearance of being irregularly grown. It was thought, however, desirable to include it in the Permian list, and to affix an epithet to it, for the sake of reference. Mr. King, not being acquainted with it, and consequently considering it a "doubtful species," placed it in the Appendix to the 'Permian Monograph' (p. 247), in which position it has been overlooked by Baron Schaueroth, who has been so fortunate, by the discovery of a specimen (*Patella Hollebeni*) from the lowest bed of the Zechstein at Ilmenau, as to be able to confirm the certainty of its existence in the Permian system. As Baron Schaueroth's specimen was more perfect than the one described above, it seems advisable to extract a portion of his description, which, so far as it can be compared, agrees with the present species:—

"The first, and at present the only known *Patella* of the Permian system has an elliptical (marginal) outline, which is slightly narrower in that part of the shell in which the elevated apex occurs, so that it is rather oval. The apex is situated in a third part of the length of the shell, and its height bears a proportion of one-third to the whole length of the shell. The surface is covered with fine, crowded, concentric, raised lines, which disappear almost entirely at the apex. The latter are crossed by gradually enlarging, radiating lines from the apex, so that the whole of the surface is cancellated or cut up into wire-work markings."

The only known English example is from the shell-limestone

of Tunstall, and the German specimen was obtained from the under layer of the Zechstein of Ilmenau.

35. *EULIMA SYMMETRICA*, King.—In the “diagnosis” given by Mr. King, the general form of this shell is incorrectly stated to be “fusiform.” There is no fusiform shell in the Permian system that I am acquainted with, and Mr. King’s own figures do not represent it as such. More correctly, the general form is subulate, as the front portion of the mouth is much the broadest part of it. The surface appears to be smooth. The spire is produced to a fine point, and the very oblique suture is closely pressed in, and is not folded over, as in those shells which are generally referred to the vague genus *Macrocheilus*. Some specimens show broad bands of colour arranged as on some of the recent *Eulimæ*.

The meagre description of this good species, and the unsatisfactory figures of the ‘Perm. Mon.,’ have led Baron Schauroth to suppose that it may belong to one of the following species; but the general form of the shell is too characteristic to allow of this conclusion being permanently entertained. It attains sometimes to more than an inch in length.

In the shell-limestone of Tunstall, not very common; also in the same deposit at Humbleton and Silksworth. It does not appear to have been found yet in Germany.

36. *CHEMNITZIA ROESSLERI*, Geinitz.—In the Tyneside Catalogue I gave the first account of a fragment of a plicated shell which evidently belongs to the above, in the following words:

“*CHEMNITZIA*.—We procured a fragment of a small shell from Tunstall Hill, which possesses more of the characters of this genus than of any other we are acquainted with. It has a few gradually-increased whorls, which are very convex and deeply fluted. The suture is deep, and the pillar straight. This may be the shell included in the tabular list of the ‘Geology of Russia’ as *Loxonema rugifera*. It cannot, however, be referred to that species, nor to the genus *Loxonema*, as the suture is deep, and not pressed against the former whorl, as in that genus. It is also destitute of striæ.” In King’s ‘Cat. Org. Remains of Permian Rocks,’ published two days after the above, I find no shell described that can be identified with the *C. Roessleri*.

In the ‘Perm. Mon.,’ however, the *Chemnitzia* noticed above is affixed to a long train of names of *Loxonema rugifera*, and a new specific name, as it is called, is very quietly appended, and a “diagnosis” substituted, which would apply to a great number of species; and, in the remarks, an admission is made that “imperfect specimens, about an inch in length, of a species resembling *Loxonema rugifera*, Phillips, have twice occurred to me; but through some accident, they have been mislaid.”

Now, unless these "missing specimens" have since been found, there does not exist a type-specimen of *Loxonema Swedenborgiana*, King, according to this author's own statement; and why then should palæontology, grievously overburdened already, be pestered with another unauthenticated name?

As Mr. King's "diagnosis" and remarks do not apply to my shell, I prefer adopting the one proposed by Dr. Geinitz, especially as the same shell has been further mentioned and figured by Baron Schauroth (*Zeitschr. d. deutschen Gesellschaft* Jahrg. 1854, s. 558. taf. 21. fig. 9). But, in his last work, Baron Schauroth has given a preference to King's name without assigning any reason for the change, and he also seems inclined to think that it is only a variety of the following species.

It is more turreted than the *C. Altenburgensis*, and the plications do not appear to be accidental, but permanent and of specific value. Specimens that have occurred are about half an inch in length.

Collected in the shell-limestone of Tunstall and Humbleton by Mr. Kirkby and myself, and in Germany it is mentioned by Dr. Geinitz and Baron Schauroth.

37. CHEMNITZIA ALTENBURGENSIS, Geinitz, sp. Pl. IV. fig. 18. It seems to be necessary to trace the history of the discovery of this little shell, which has been described within the last ten years under five or six different names, in order to establish the epithet adopted above for this species.

It is, I believe, first mentioned, in the following words, in Prof. Sedgwick's paper on the "Magnesian Limestone, &c. of the North of England," *Geol. Trans.* 2nd ser. vol. iii. p. 118:—

"To this list may be added (five *errata*.) a species of *Melania*? less than half an inch long, with eight whorls; Hawthorne Hive. (MS. Catalogue by Mr. J. Phillips.)" No specific name is applied to it.

The next mention of it (unless the *Murchisonia subangulata*, Vern., be the same shell), and the first accompanied with a short description, figure, and specific name, is by Dr. Geinitz in the 'Versteinerungen des deutsch. Zechsteingebirges,' p. 7. tab. 3. figs. 9, 10. The short description is in the following words:—

Turbonilla Altenburgensis, "a little tower-shaped snail, with six or more rounded, smooth whorls," &c.

Next, in the Tyneside Catalogue, p. 240, it is thus characterized:—

"TURRITELLA PHILLIPSII, n. s. Shell elongated, narrow, slightly tapering, turreted; spire with 12 or more rounded whorls, which are rather convex and slightly flattened behind; suture deep; pillar-lip slightly angulated in front; aperture suborbicular." And "T. TUNSTALLENSIS. Shell elongated conical; spire with 8

whorls, which are much rounded, smooth; suture deep; aperture orbicular."

Notwithstanding the differences pointed out, after examining a large series of specimens, I am now of opinion that the latter shell is only a variety of the former.

The next two notices of this shell are by Mr. King, 'Cat. Org. Remains,' &c. p. 13, and 'Perm. Mon.' pp. 209, 210. In both these works it has the following "diagnosis":—

"*LOXONEMA FASCIATA*, n. sp. *A subulate, many-whorled, smooth species, with two or more dark-spiral bands, crossed by others, on a light ground; its outer lip is inversely sigmoid.*"

If this "diagnosis" had not been accompanied with a figure, I could not have identified it with the preceding shells; but the figure in 'Perm. Foss.' tab. 16. f. 30, establishes its relationship to them without doubt, and at the same time it shows that Mr. King's "diagnosis" of the species is incorrect. The general form is not "*subulate*," but turreted, or tower-shaped, as Geinitz expresses it. The terms "dark-spiral" and "inversely sigmoid" are not very intelligible.

In 'Perm. Mon.' Mr. King places both the *Turritella* described in the Tyneside Catalogue with his *L. fasciata*. This would not have surprised me in the least, had he not immediately afterwards (Perm. Mon. p. 210) redescribed the *Turritella Phillipsii* under a new specific name, *Loxonema Geinitziana*. That the shells described under both these names are identical, cannot be denied by any one able to admit the truth; and it is certainly much to be regretted that such an oversight as this and many others pointed out in this paper disfigure the fair pages of the 'Permian Monograph.'

In the 'Journal of the Dublin Geol. Soc.' April 1856, Mr. King mentions, under the name *Rissoa? Altenburgensis*, Gein., the occurrence of this little shell in the Permian rocks of Ireland.

Lastly, in Germany, Baron Schauroth, in his last contribution on Permian Fossils (Zeitschr. d. deutschen geologischen Gesellschaft Jahrg. 1856, s. 241, 242), adopts for this species King's inappropriate epithet *Geinitziana*, and unites with it the *L. fasciata*, King, and the *Turbonilla Altenburgensis*, Geinitz. In the same paper the *Loxonema Geinitziana*, King, is redescribed under the new name *Rissoa gracilis*. I have been favoured by Baron Schauroth with some carefully-made clay-casts of these shells, and I think they are perfectly identical with those from the English Permians.

All the shells enumerated above are, I believe, referable to one species; and the name given to it by Geinitz originally ought to be adopted for it at present.

In addition to the characters given above under *Turritella Phillipsii*, it may be stated that in very many specimens the whorls are very much flattened or bevelled, both above and below, causing a deep suture, and the middle part of the whorls to appear as if doubly keeled. In some few specimens, indeed, there are indications of obsolete spiral striæ, and Mr. Kirkby has collected one specimen in which the last two whorls have several very strong spiral striæ, though the other whorls have the smooth normal appearance only. This tendency of the whorls to a double keel inclines me strongly to think that the *Murchisonia subangulata*, Geinitz, is only the same shell; and it may also happen that the original Russian *M. subangulata*, Vern., is identical with the present species. Some of Mr. Kirkby's specimens also show two or three coloured spiral bands running round the whorls parallel to the suture, as figured by Mr. King in the 'Perm. Mon.'

It occurs in the shell-limestone of this district, chiefly at Tunstall.

38. *LITTORINA HELICINA*, Schloth. sp. Pl. IV. figs. 19, 20, vars.

Most authors describe the typical form of this species as having only three or four whorls, yet all the best full-grown specimens have five or six. The nucleus of the shell and the succeeding whorl are quite smooth, and in a few instances this smoothness is continued through the whole period of growth. This variety is termed *Rissoa obtusa*, Brown, and *Turbo Permianus*, King. Generally, in the typical *L. helicina*, after the first two or nucleal whorls, the shell begins to be ornamented with more or less numerous, much or slightly developed striæ running parallel with the suture, which are fewer, stronger and more prominent on the middle, and fainter and more numerous on the lower part of the whorl. The spire also in some instances is much drawn out, in others much depressed, causing the body-whorl to appear in the latter case much larger than usual. The ornament of the shell has sometimes the form of flattened, angulated planes over the upper part of the whorls, which are in a few instances so obscure as to be scarcely perceptible (see Pl. IV. figs. 19, 20), and it is thus that the typically ornamented forms are united with the smooth variety above mentioned. I can find no character by which to distinguish the *Turbo Mancuniensis*, Brown, from this, which certainly is identical in its common form with typical specimens of *Trochilites helicina*, Schloth., received from Germany. A glance at the figures in the 'Perm. Mon.' tab. 16. f. 19-22, is sufficient to convince any sound naturalist of the identity of *helicina* and *Mancuniensis*.

The form which was separated under the epithet *L. Tunstall-*

ensis in the Tyneside Catalogue, and in the 'Cat. Org. Rem.' under the specific name *Turbo Thomsonianus*, must also be referred to the *L. helicina*. It is smaller than the typical form of *helicina*, and the spire is considerably drawn out, which gives the whorls a much rounder appearance, and the striæ are finer and closer to each other, and do not affect the rotundity of the whorls, as in typical individuals. The *Rissoa Gibsoni*, Brown, appears to be only a cast of this variety, which is also described by Geinitz as *Trochus pusillus*, Verst. pl. 3. f. 15, 16.

King's *T. Taylorianus* is, I think, a very stunted form of this species. It has the spire only very slightly elevated, and the striæ are more numerous, more closely set and thicker in appearance than usual.

To the typical form of this species, *Trochilites helicina*, Schloth., may be added the *Turbo Mancuniensis*, Brown, and the *Turbo minuta*, Brown.

In the first variety may be placed *Rissoa obtusa*, Brown, *Natica minima*, Brown, and *Turbo Permianus*, King; and in the second variety, *Rissoa Gibsoni*, Brown, *Trochus pusillus*, Geinitz, *Littorina Tunstallensis*, Howse, and *Turbo Thomsonianus*, King.

Note on the originals of Capt. Brown's species.—*Turbo Mancuniensis*. Mr. Binney's three original specimens of this shell, from the Permian marls of Lancashire, are rather more obtuse in the spire than those from the shell-limestone of this district. The whorls have also a more rounded appearance. One of the specimens was worn, and very much rubbed. The other two had the markings sharp and well defined. Aperture nearly circular, with a slight notch behind the pillar-lip, but no umbilicus. The largest specimen, which shows the mouth, not quite perfect, is $\frac{1}{4}$ of an inch in length. It has three strong ribs on the body-whorl, with an intermediate faint one above, and several smaller, closer striæ beneath. The two specimens of *Turbo minutus* in the same collection are undoubtedly, as I pointed out formerly in the Tyneside Catalogue, only the younger state of *T. Mancuniensis*, as is well shown by the unfinished state of the mouth of one of the specimens.

Two of the original casts of *Rissoa obtusa*, Brown, are not in a state good enough to describe. One of them is very much compressed. The other specimen is more perfect than these, but is also a cast. It has four rounded whorls and a short spire, but the apex is not quite perfect. The *Natica minima*, Brown, a cast with imperfect spire, is undoubtedly the same as *R. obtusa*. The originals of Capt. Brown's *Rissoa Gibsoni* are also casts. Two of them are very much compressed, so that the spire has not the natural appearance. The third speci-

men closely resembles the *R. obtusa*, but its spire is longer, being more perfect than the others at the apex.

The estuarine character of these Lancashire shells was pointed out, many years ago, by Mr. Binney, in the 'Manchester Geological Transactions,' vol. i., and this opinion was very forcibly impressed upon me when examining the originals belonging to that gentleman. The larger and more typical individuals from the shell-limestone of Durham have probably lived in less-confined habitats, but still they have a decidedly littoral character. It must be mentioned here, that I have used the term 'littoral' in contradistinction to 'pelagic,' and not in the limited sense in which it is used by British naturalists.

This species occurs in the middle and upper divisions of the magnesian limestone, but the most typical and finest specimens are from the shell-limestone of Tunstall.

39. *LITTORINA HERCYNICA*, Geinitz.—This species had been described and figured by Dr. Geinitz in the 'Versteinerungen,' several months before Mr. King's imperfect notice of it in the 'Cat. Org. Rem.' appeared. It was identified in the Tyneside Catalogue with *Natica minima*, Brown; but an examination of the latter proves this identification to be incorrect. Dr. Geinitz and Mr. King both place this shell in the genus *Natica*, but it is rather difficult to comprehend why they do so, for it has a nearly orbicular mouth, is not apparently a polished shell, is not umbilicated, and bears a strong resemblance to the *Littorinæ*. By comparing the mouth of this species (Perm. Mon. pl. 16. f. 28) with that of *L. helicina* (pl. 16. f. 22), it will be seen how strikingly similar to each other they are in form. In Mr. King's figures, the spire of the shell is represented much too high, and his "diagnosis" is so jumbled, that it would be in vain to hope to identify the species by it.

The surface of the shell is ornamented with very fine, wavy, longitudinal striæ. This peculiar character is well displayed on some specimens collected by Mr. Kirkby at Field House.

Baron Schauroth has lately united this species to the *Euomphalus Permianus*, King, at the same time removing the latter into the genus *Rissoa*. After examining some examples of this supposed species from both German and English localities, I think it is probably only the young of *Littorina Hercynica*. The figure given by Mr. King, with its few whorls and unfinished mouth, is evidently only a young shell.

In the shell-limestone of Tunstall, Silksworth, and Field House, but not common.

40. *PLEUROTOMARIA ANTRINA*, Schloth. Pl. IV. figs. 21, 22, 23, 24. 25.

In well-preserved specimens of this shell, the whole of the

surface is ornamented with distinct longitudinal lines, but they are never so much raised as in the following species, and the surface never presents the same finely decussated appearance. In young specimens the suture follows the line of the fissure of the preceding whorl, but it falls considerably below it in some adults, which have consequently a less conical appearance. The upper surface of the whorls is either slightly arched or nearly flattened, and this variation is respectively represented on the under surface, which has, in the latter case, a flattened, truncated, and in the former a tumid appearance. These variations are shown in the figures referred to in the accompanying plate.

The false species and erroneous identifications of this very characteristic shell are corrected in the Table given at p. 39; but the last two synonyms must be cancelled, for reasons stated under the preceding and under the following species.

Rather plentiful in the shell-limestone of Tunstall, but rare in several other localities.

41. *PLEUROTOMARIA VERNEUILI*, Geinitz.—I find, since the Table of species was printed, that Baron Schauroth has identified the *Pleurotomaria nodulosa*, King, with the *Pleurotomaria Verneული*, Geinitz. As this identification is undoubtedly correct, and as Geinitz's description and figure appeared several months before King's Catalogue, the name adopted above has right of priority.

In well-preserved specimens the whole surface of the shell is ornamented with strong, longitudinal, raised lines, which being cut obliquely by the strong lines of growth, give the whole surface a beautifully decussated appearance. The double row of nodules is not so persistent a character as the former, for the sutural row is not seen on young individuals, and the row placed below the fissure becomes obsolete in very large full-grown specimens. It appears to have been the most beautiful and delicate shell of the Permian seas, and from the numerous examples of bored shells that occur,—a fact which I first pointed out to Mr. King,—it probably, with its congener *P. antrina*, preyed upon its more peaceful and unprotected neighbours.

The specimen figured in 'Perm. Mon.' is a young individual. The largest specimen I have seen exceeded an inch in length and width.

It occurs in the shell-limestone of Tunstall and Humbleton.

CEPHALOPODA.

42. *NAUTILUS FRIESLEBENI*, Geinitz. Pl. IV. fig. 26, *juv.*

If, instead of dismembering this fine species, Mr. King had endeavoured to trace its variations through all its periods of

growth up to the adult state, he would have deserved our best thanks, and would have contributed something towards the full understanding of its true character. But it has pleased him better, instead of so doing, to represent and describe the young of it as a new species,—*N. Bowerbankianus*. The last chamber only is the part principally represented of *N. Frieslebeni*, and from it the characters of the whole shell, with the aid of Geinitz's description, appear to be drawn; for the figure, pl. 17. fig. 16, does not contribute much towards the elucidation of the species.

If one examines the principal characters of Mr. King's new species, viz. "*deeply umbilicated; whorls increasing rather rapidly in size; slightly embracing (?) each other,*" it will be seen that they are only the characteristics of young individuals; if they are anything more, it will be necessary, in order to establish the specific identity of *N. Bowerbankianus*, for Mr. King to represent the young state and mode of growth of *N. Frieslebeni*, and show in what points they differ. Until this has been done, it is better to consider *N. Bowerbankianus* as the young state of the present species.

Very young specimens are much rounded in form, and ornamented with strong, decussated striæ. The outer chamber of Mr. Kirkby's largest specimen is nearly 4 inches in length, and $2\frac{1}{2}$ in greatest breadth.

In the shell-limestone of Tunstall, Humbleton, Dalton-le-dale, &c., and, according to Mr. King, in the compact limestone of Whitley.

PTEROPODA.

43. THECA? KIRKBYI, n. s. Pl. IV. fig. 27, restored.

Shell straight, tapering gradually; aperture transversely oval; surface with small, transverse, wavy furrows: four thin decurrent wings run along the whole length of the shell.

This is the only Pteropod that I am acquainted with in the English Permians. The restored outline in the accompanying plate will serve to give an idea of its form and size. I have found only one specimen which shows the above characters, and which indicates probably a closer alliance with the *Creseis*, Rang, than with the genus in which it is provisionally placed.

It is dedicated, with great respect, to Mr. James Kirkby of Sunderland.

From the shell-limestone of Tunstall.

It seems desirable to substitute the term "Botryoidal" for the epithet Conglobated, proposed in a former part of this paper;

